

ЛІВІЯ ВІД ІСЛАМІЗАЦІЇ

CLAMS Data Workshop (Feb. 27-28, offsite NASA GSFC (Greenbelt, Maryland)

hop: progress on data, plan activities and publication, special session a

opeake Lighthouse and Aircraft Campaign for Satellites (CLAMS)
was held during summer 2001

IS focused on SW and aerosols over clear ocean

aft (CLAMS) & long-term, rigid sea platform (COVE with BSRN, AERONET)

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CERES Brussels Jan 2002

Surface and Atmospheric Radiation Budget Working Group (WG) Meeting Tuesday

Joint with Inversion WG (~30 min.)

CARB WG moves to separate room (~0900-1000)

Informal meeting

Questions on new product release

nology

Cloud Radiation Swath:

Instantaneous footprint with Surface and Atmospheric Radiation B
adjusted inputs (clouds, aerosols, PW, TOA)

ed: Radiation from Fu-Liou code using inputs mostly from SSF

: “Constrained” radiation from iteration with adjusted inputs

Hourly gridded SSF (clouds and TOA) and CRS

CERES product that is released but not publishable

eta1: Test version which has been mostly erased

eta2: Jan.-Aug. 1998 but has significant bugs.
Quality Summary on web.

eta3: Jan. & Feb. (and more?) 1998 run on DAAC.
Science Computing Facility (SCF) validation subsets
are shown in this presentation

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CRS Beta2 (TRMM Jan-Aug 1998)

Tuning not tight for TOA SW & LW
Tighter for LW & filtered WN radiance

Bug #1: Ice cloud diameter
D_e to D_{ge} conversion not active

Bug #2: Cloud top placement tuning

Bugs cause errors in SARB cloudy fraction

Constrainment – tuning to approach CERES observations
A priori uncertainty (“sigma”) for each adjustable parameter

TOA – all footprints	Sigma (%)	Minimum sigma (MKS)	Adjustable parameter
Beta2	5.0 %	2.0 Wm-2	reflected SW flux
	2.0 %	2.0 Wm-2	broadband LW flux
	1.0 %	1.0 Wm-2	window WN flux
	1.0 %	0.3 Wm-2 sr-1	broadband LW radiance
	1.0 %	0.3 Wm-2 sr-1	filtered window radiance

Cloudy footprints	Sigma	Adjustable parameter
	0.15	$d \ln(\tau)$ τ =optical depth
	2.0 K	cloud top temperature
	0.05	total cloud fraction in footprint
	0.025	fraction swap of 2 types in footprint (i.e., increase Cu and decrease Ci)

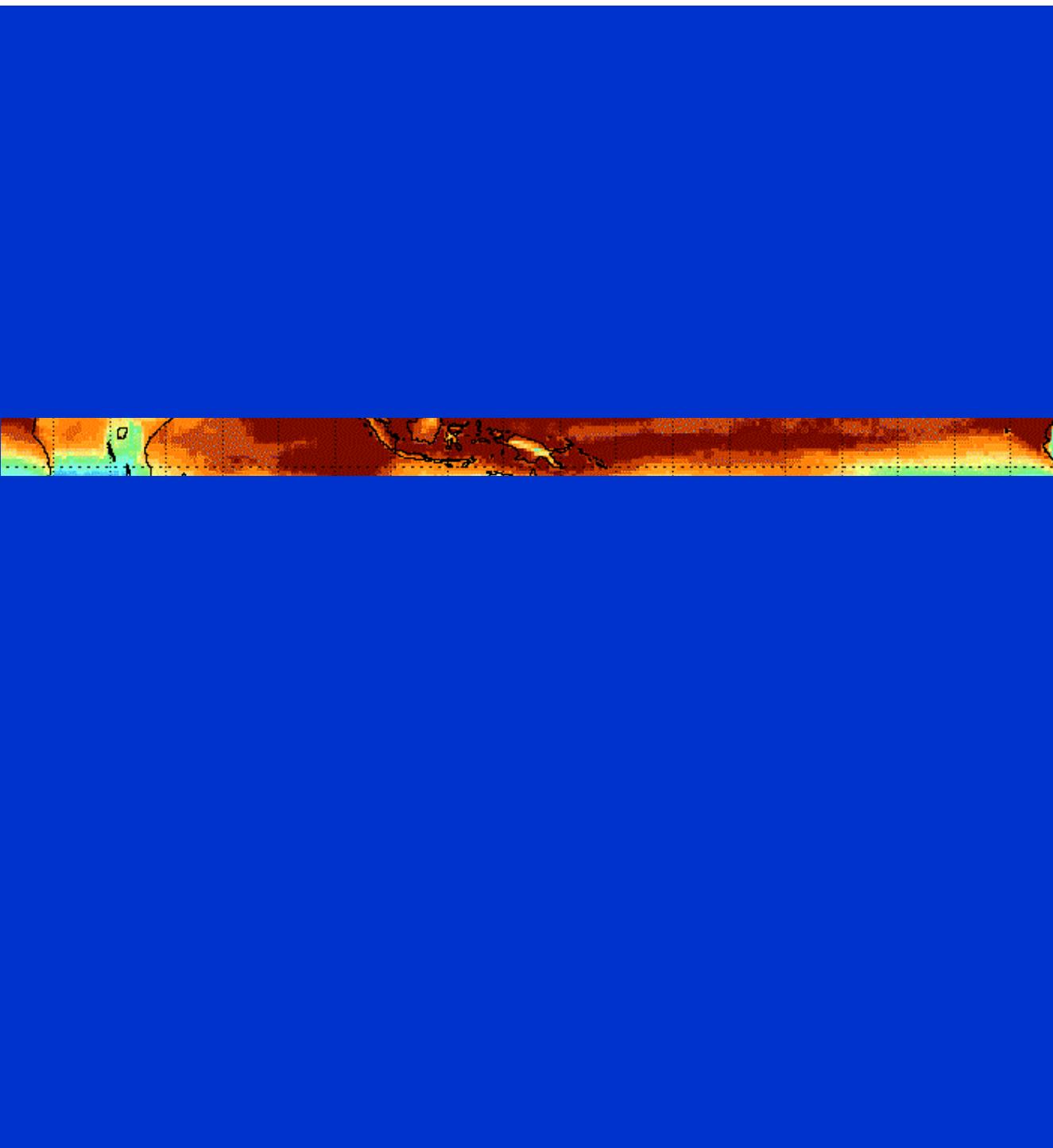
Clear footprints	Ocean	Land	Adjustable parameter
	1.0 K	4.0 K	surface skin temperature
	0.15	0.10	$d \ln(PW)$ PW: surface to 500 hPa
	0.15	0.10	$d \ln(UTH)$ upper tropos. humidity
	0.002	0.015	surface albedo
	0.50	0.10	$d \ln(\tau)$ aerosol optical depth

Aerosol optical thickness (AOT) at 0.63 um

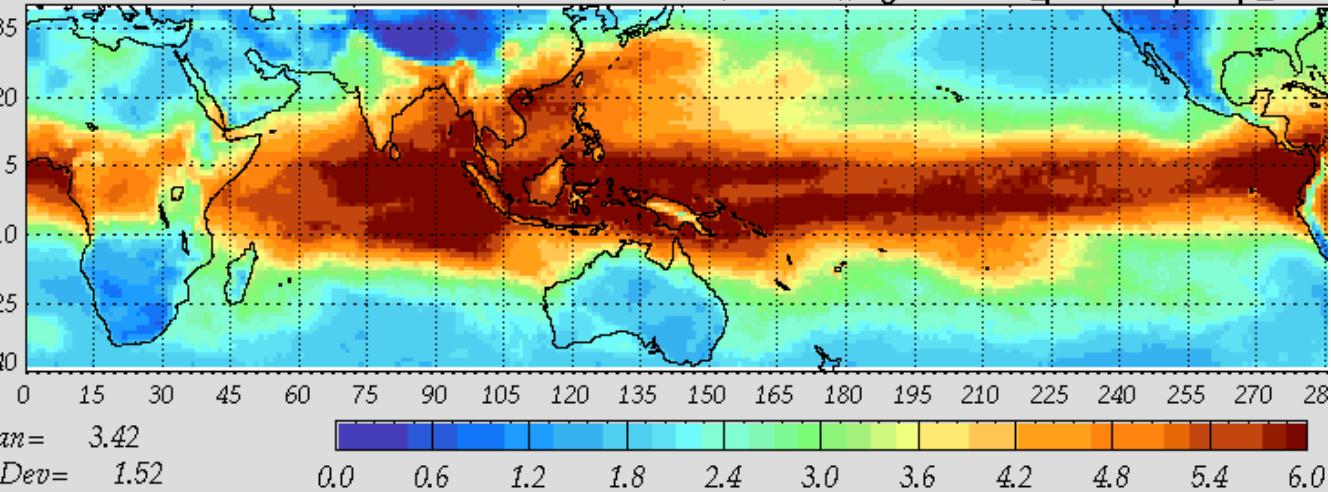
- from SSF VIRS retrieval over clear ocean
- otherwise use Collins-Rasch MATCH assimilation

Aerosol properties assigned from MATCH assimilation

MATCH aerosol type	----- SARB assignment -----	
	Optical properties	Scattering
dust (0.01-1.0 um)	dust (0.5 um) Tegen-Lacis	3 km
dust (1-10 um)	dust (2.0 um) Tegen-Lacis	1 km
dust (10-20 um)	dust (2.0 um) Tegen-Lacis	1 km
dust (20-50 um)	dust (2.0 um) Tegen-Lacis	1 km
hydrophilic black carbon	soot (OPAC)	1 km
hydrophobic black carbon	soot (OPAC)	1 km
hydrophilic organic carbon	soluble organic (OPAC)	1 km
hydrophobic organic carbon	insoluble organic (OPAC)	1 km
sulfate	sulfate (OPAC)	1 km
sea salt	sea salt (OPAC)	0.5 km

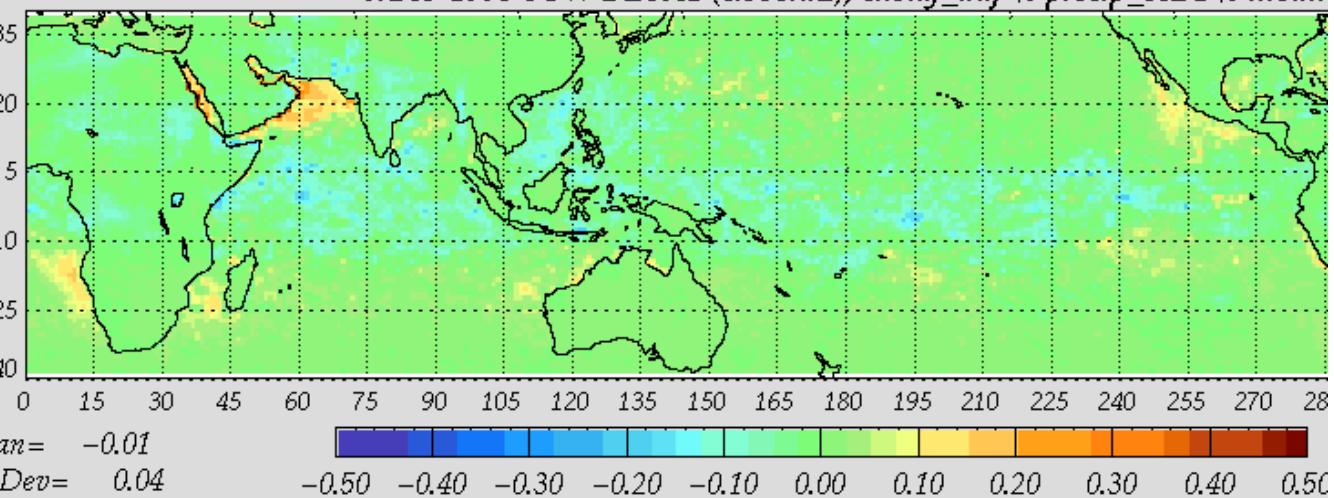


MAY 1998 FSW BETA1 (crsbeta2),region%misc_params%precip_h2o



beta1.pro /usr3/rose/ceres/fsw/CER_FSWB_TRMM-PFM-VIRS_Beta1_009010.199805Z.01.cor Parm: 87

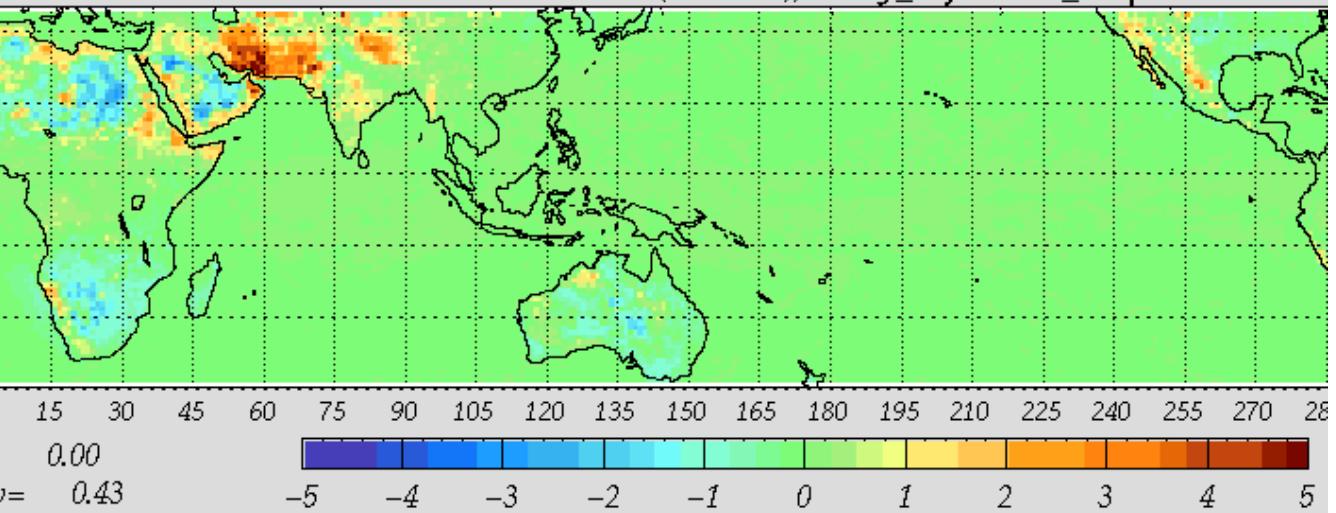
MAY 1998 FSW BETA1 (crsbeta2), clrsky_adj % precip_H2O% mean



beta1.pro /usr3/rose/ceres/fsw/CER_FSWB_TRMM-PFM-VIRS_Beta1_009010.199805Z.01.cor Parm: 93

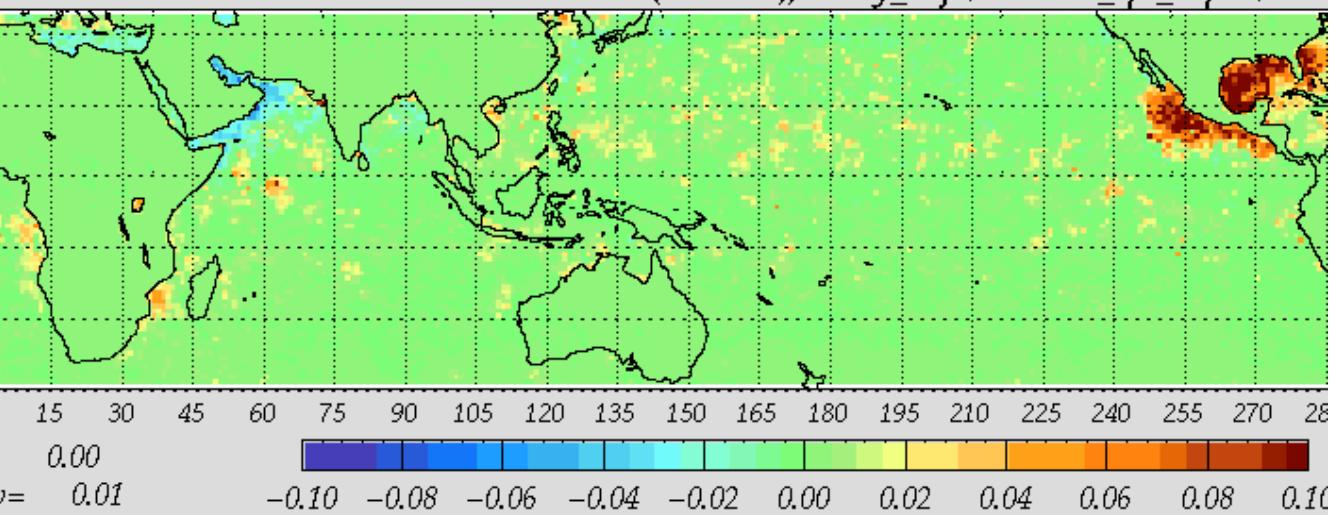
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MAY 1998 FSW BETA1 (crsbeta2), clrsky_adj % skin_temperature% me



ra /usr3/rose/ceres/fsw/CER_FSWB_TRMM-PFM-VIRS_Beta1_009010.199805Z.01.cor Parm: 92

MAY 1998 FSW BETA1 (crsbeta2), clrsky_adj % aerosol_opt_depth% me



ra /usr3/rose/ceres/fsw/CER_FSWB_TRMM-PFM-VIRS_Beta1_009010.199805Z.01.cor Parm: 91

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Single Day
May 01 1998
CRS Beta2

CRS Beta2

(“old” Fu-Liou
+ fudged OLR
+ SARB cloud bugs)

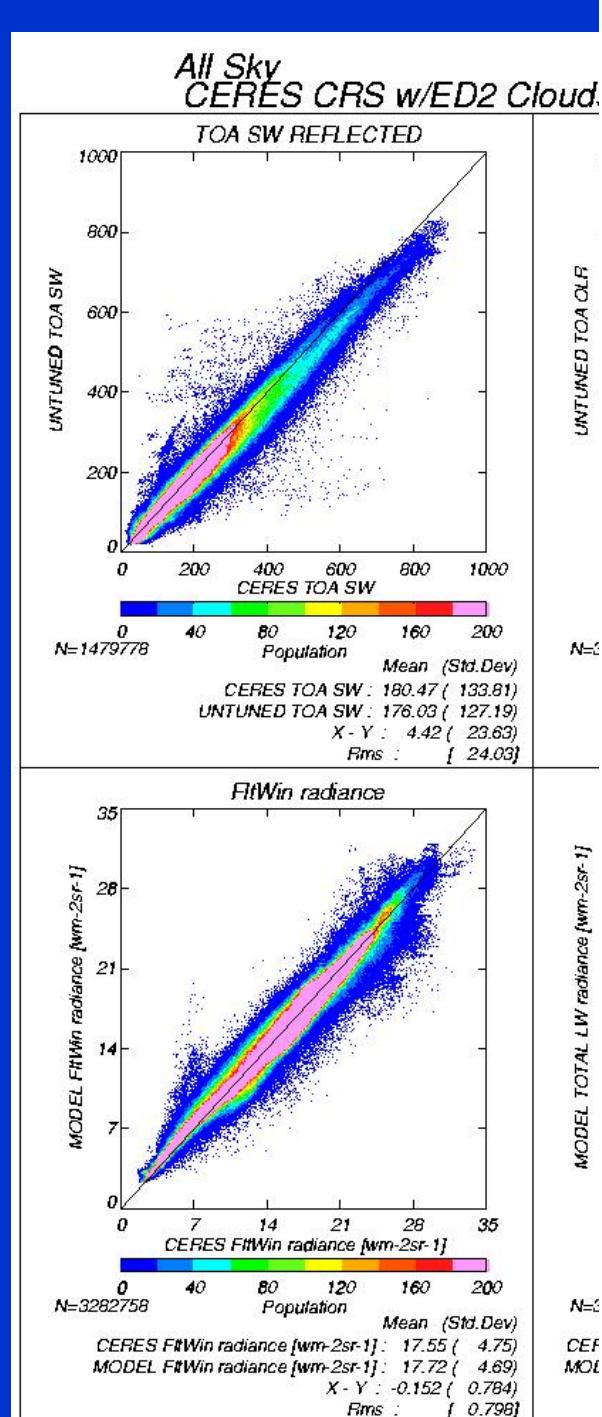
Untuned

All sky

All Sky:
Ceres –Fuliou
bias [RMS]

TW Flux	OLR
42	-1.76
[4.03]	[7.35]
Lat Window	Tot LW Rad
0.152	-0.049
[0.798]	[2.31]

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CRS Beta2

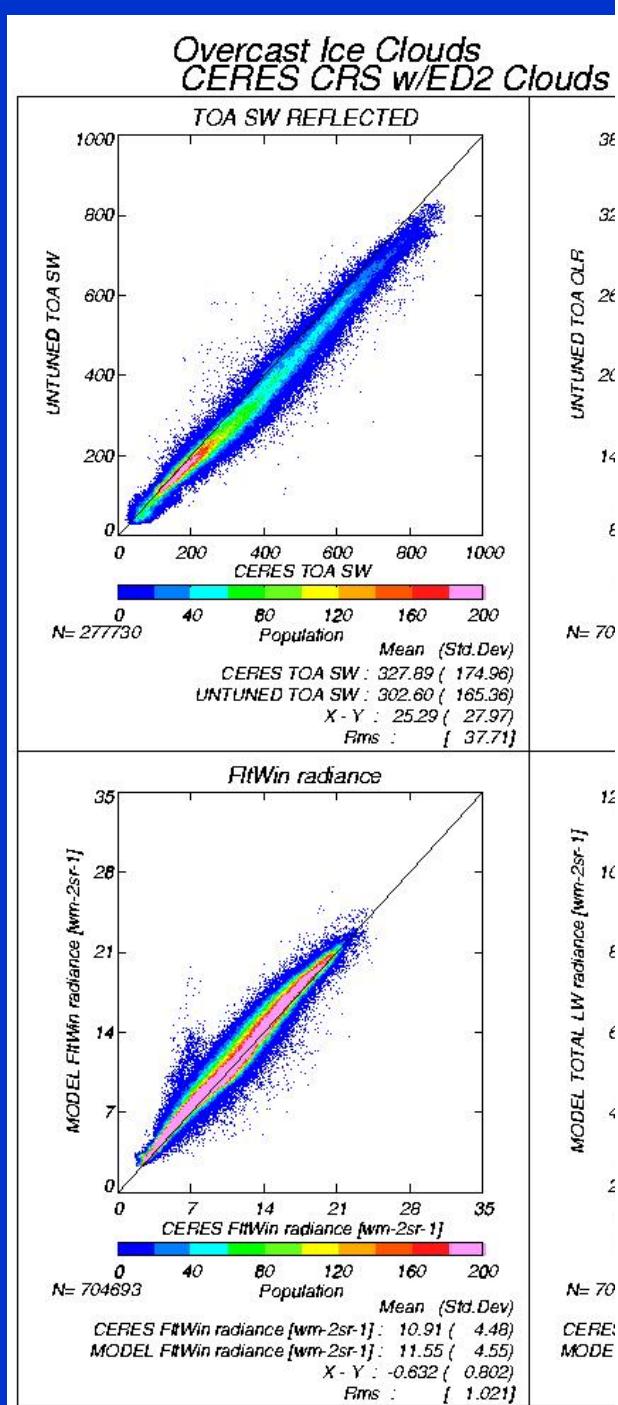
(“old” Fu-Liou
+ fudged OLR
+ SARB cloud bugs)

Untuned Overcast Ice

Overcast Ice Clouds:
Ceres –Fuliou
bias [RMS]

W Flux	OLR
25.29	-6.75
[7.7]	[10.54]
Lat Window	Tot LW Rad
0.63	-1.63
[.02]	[3.16]

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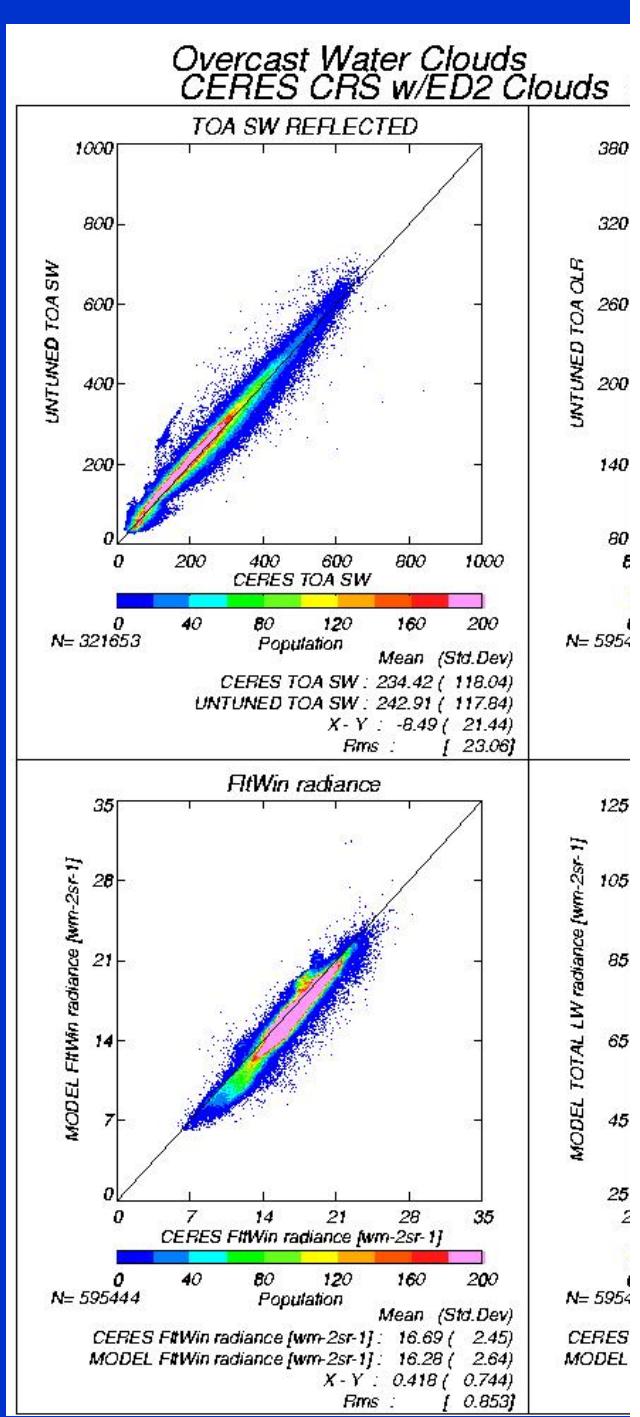


CERES Beta2 Untuned ("old" Fu-Liou + fudged OLR + SARB cloud bugs) Overcast Water

Overcast Water Clouds:
Ceres –Fuliou
bias [RMS]

SW Flux	OLR
5.49	-0.72
[3.06]	[6.79]
Lat Window	Tot LW Rad
42	1.06
[0.853]	[2.39]

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SARB tuning for TOA flux (radiance) is tighter (looser) in CRS Beta

TOA – all footprints	Sigma (%)	Minimum sigma (MKS)	Adjustable parameter
Beta2	5.0 %	2.0 Wm-2	reflected SW flux
	2.0 %	2.0 Wm-2	broadband LW flux
	1.0 %	1.0 Wm-2	window WN flux
	1.0 %	0.3 Wm-2 sr-1	broadband LW radiance
	1.0 %	0.3 Wm-2 sr-1	filtered window radiance

TOA – all footprints	Sigma (%)	Minimum sigma (MKS)	Adjustable parameter
Beta3	1.0 %	2.0 Wm-2	reflected SW flux
	1.0 %	2.0 Wm-2	broadband LW flux
	2.0 %	1.0 Wm-2	window WN flux
	5.0 %	0.3 Wm-2 sr-1	broadband LW radiance
	5.0 %	0.3 Wm-2 sr-1	filtered window radiance

Beta3 (new Fu-Liou and sigmas) vs Beta2 (old Fu-Liou & sigmas & bug) expressed with simple ensemble means (Jan. 199

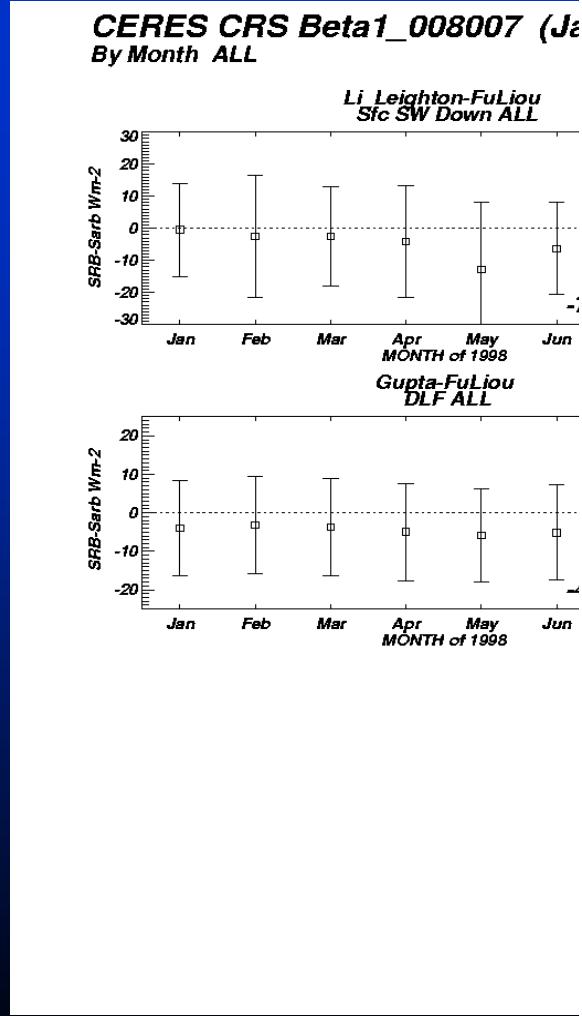
Jan. 1998	Beta3 All Sky		Beta2 All Sky	
	LW "div." (Wm-2)	SW abs (fraction)	LW "div." (Wm-2)	SW (fraction)
TOA	-8.7	0.040	-11.7	0.040
tropopause	-70.3	0.080	-76.1	0.080
500 hPa	-110.8	0.111	-106.2	0.111
surface	-62.3	0.490	-60.9	0.490

Jan9 8	Obs SW	Obs OLR	SFC SW		SFC DI	
			SSF -CRS	FuLiou	SSF -CRS	FuLiou
Beta						
1	142.121	251.454	0.477	294.569	3.925	371
2	143.283	252.535	1.451	297.818	0.951	371
3	143.280	252.533	-1.1.21	297.133	1.851	370

CRS Beta1:

Surface SW & LW
Downwelling
Jan-Aug_1998
SRB(ssf)-SARB(crs tuned)
ALL SKY

CRS Jan-Aug 1998 SRB(ssf)-SARB(crs tuned) ALL SKY Bias [RMS]
SW Downwelling @Surface -7.01 [16.96]
LW Downwelling @ Surface -4.62 [12.37]



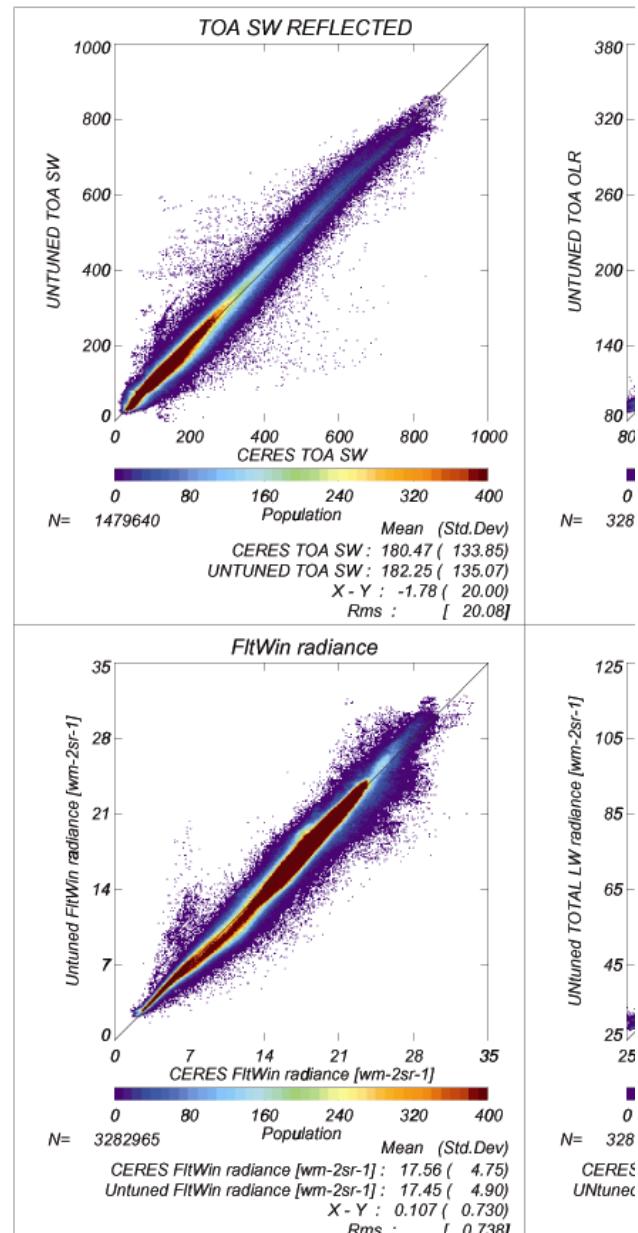
S Beta3
 by Fu-Liou, SARB
 (all bugs removed)
 Untuned
 All Sky

CERES - (Fu-Liou)
 Bias
 [RMS]

Flux	OLR
.78	1.45
.08]	[6.75]
WN rad	LW rad
11	0.39
74]	[2.15]

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ALL SKY :UNTUNED
 CRS Beta3@SCF_Fullday
 MAY 1st 1998



S Beta3

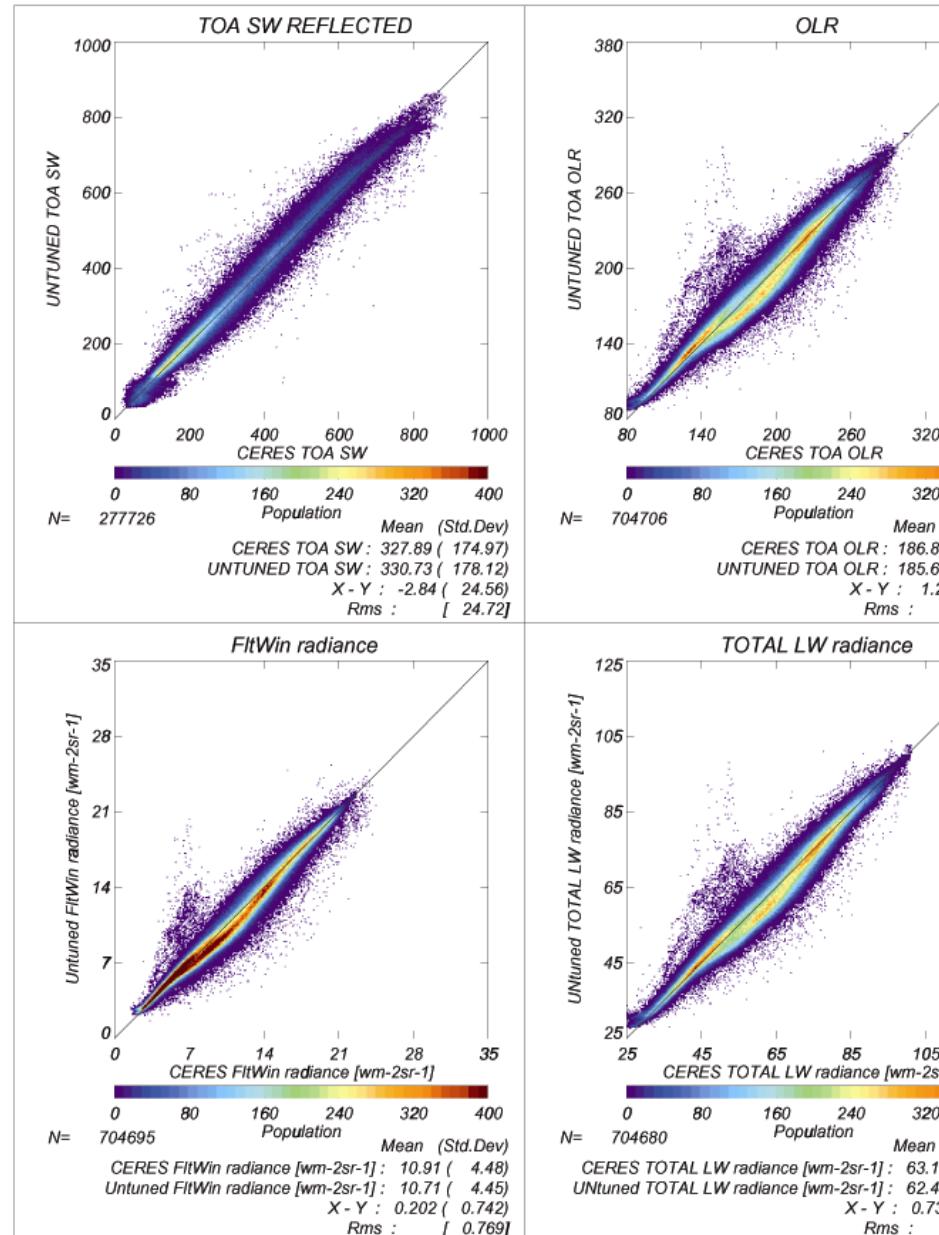
(Fu-Liou, SARB
(and bugs removed)
untuned
overcast Ice

CERES - (Fu-Liou)
Bias
[RMS]

Flux	OLR
.84	1.22
.72]	[8.48]
WN rad	LW rad
20	0.73
77]	[2.73]

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OVERCAST ICE CLOUD :UNTUNED
CRS Beta3@SCF_Fullday
MAY 1st 1998



S Beta3

y Fu-Liou, SARB
(and bugs removed)
tuned
overcast Water

ERES - (Fu-Liou)

	Bias [RMS]	utovcwat
lux	OLR	
0	1.26	
06]	[6.78]	
VN rad	LW rad	
2	0.99	
2]	[2.38]	

S Beta3
by Fu-Liou, SARB
(all bugs removed)
tuned
near Sky

ERES - (Fu-Liou)	
Bias	utclr3
[RMS]	
lux	OLR
0	2.12
3]	[5.43]
N rad	LW rad
3	0.09
0]	[1.56]

S Beta3

by Fu-Liou, SARB
and bugs removed,
(after tuning)

named

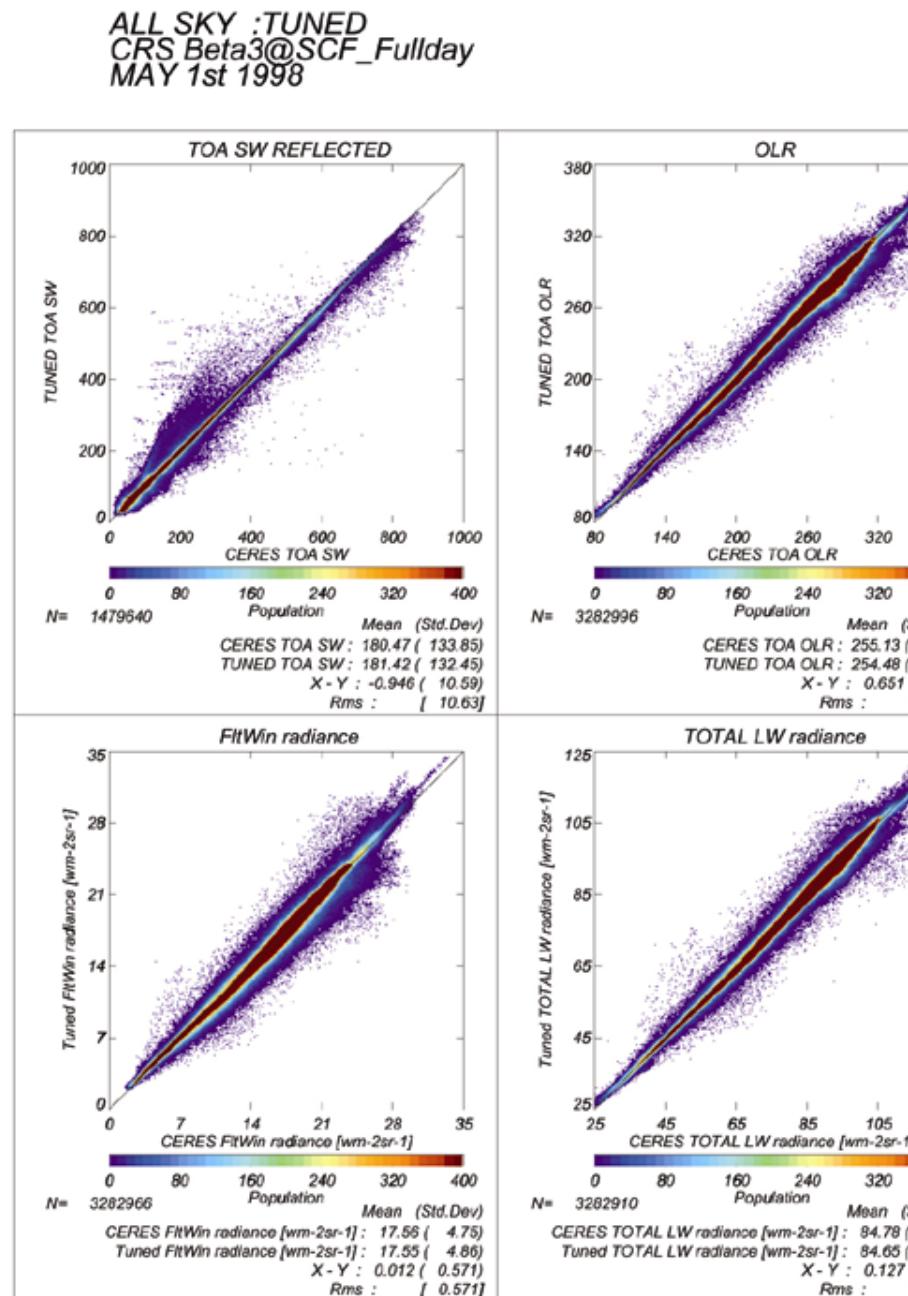
near Sky

ERES - (Fu-Liou)	
Bias	tuclr3
[RMS]	
lux	OLR
1	1.26
4]	[2.90]
N rad	LW rad
0	-0.19
2]	[0.86]

S Beta3

Fu-Liou, SARB
(and bugs removed)
tuned
All Sky

CERES - (Fu-Liou)	
Bias	tuall3
[RMS]	
Flux	OLR
.95	0.65
.63]	[3.81]
WN rad	LW rad
01	0.13
57]	[1.33]



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Beta3 SQUEEZE

A sigma

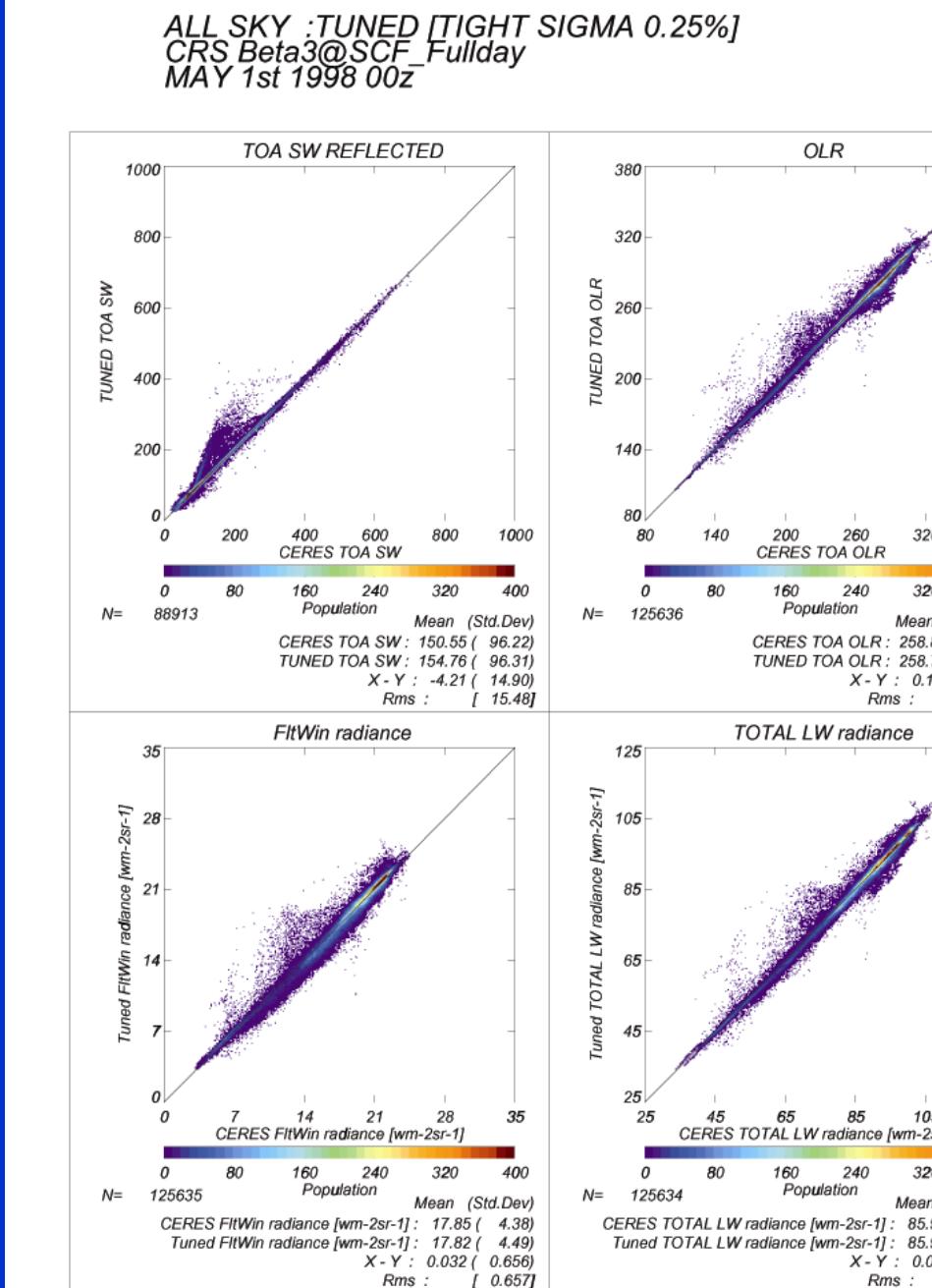
0% - -> 0.25%

tuned

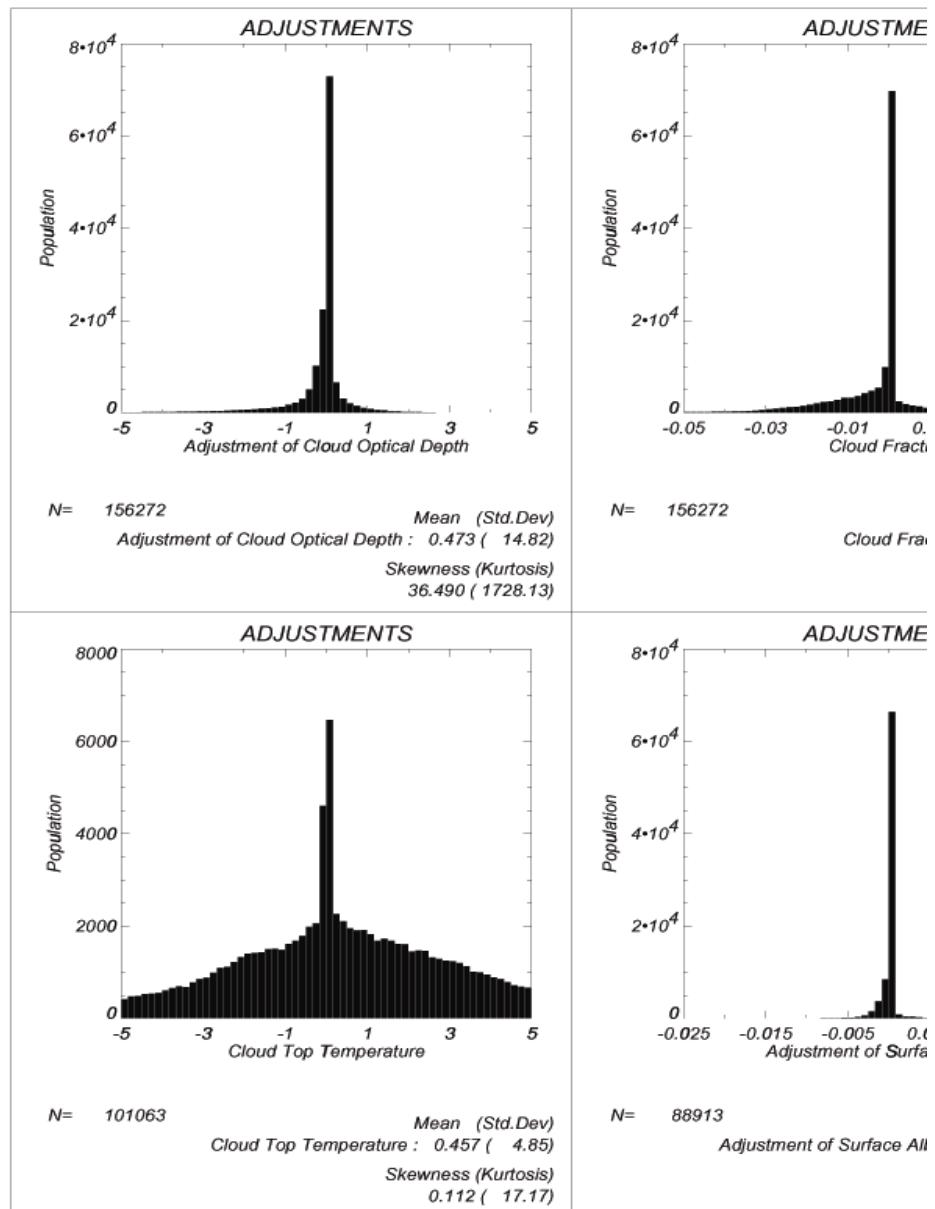
All Sky

CERES – (Fu-Liou)	
	Bias [RMS]
Flux	OLR
1 worse	0.17 better
48]	[3.91]
WN rad	LW rad
03	0.02
66]	[1.47]

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*ALL SKY: [Tight. Sig 0.25%]Adjustments(Cl_dTau, Cl
CRS Beta3@SCF Fullday
May 1st 1998 00Z*





NASA Langley CERES ARM Validation Experiment CAVE



Top of Atmosphere
Broadband Radiation

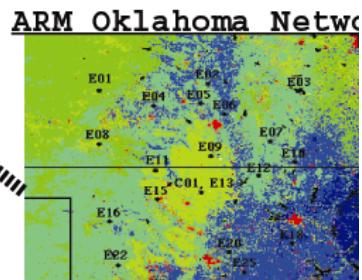
Calibrated
Continuous

Collocated
Long Term

Closure for
Net Atmospheric
Radiation



Surface
Broadband
Radiation



CAVE provides on-line surface and collocated CERE data at over 30 sites worldwide (ARM+SURFRAD+CMDL+BS)
<http://www-cave.larc.nasa.gov/cave/>

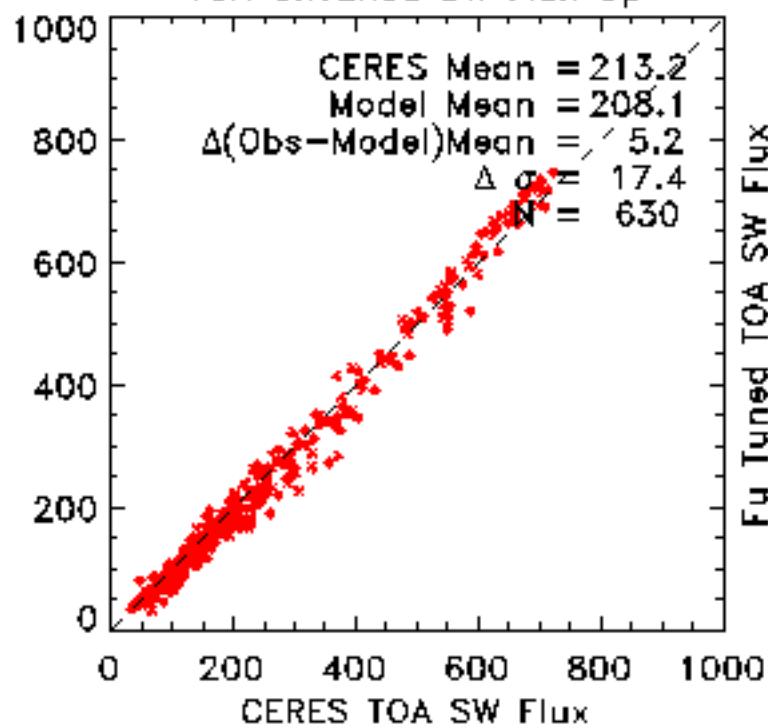
Beta 3

All Sky TOA SW Flux(W/m^2)

TOA CERES/SARB Calculations Matched from CAVE Surface

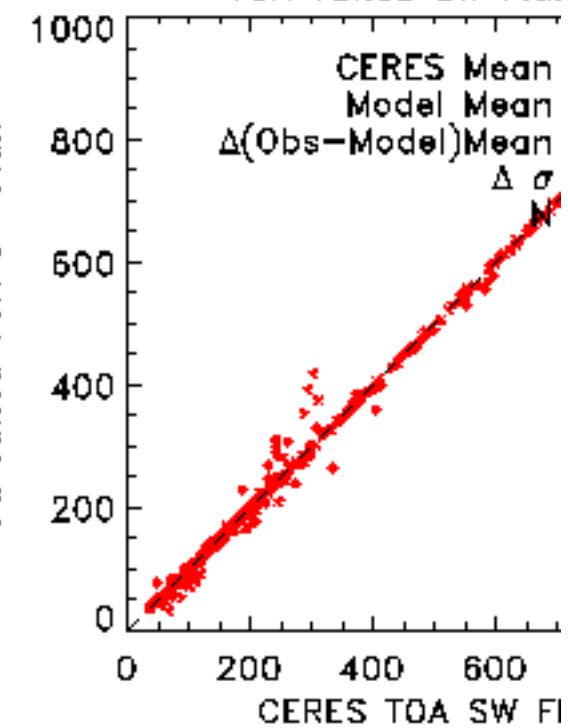
Apr 1998

TOA UnTuned SW Flux Up



Apr 1998

TOA Tuned SW Flux



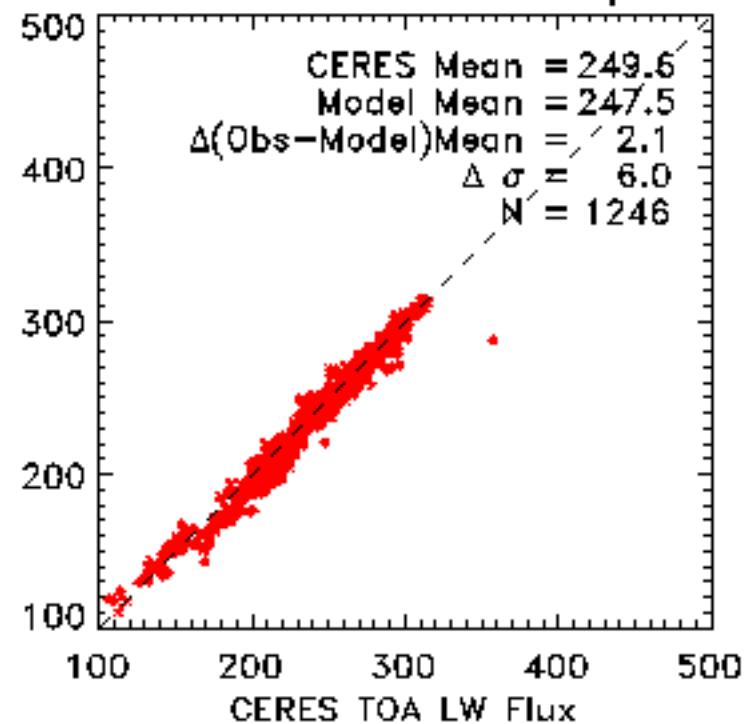
Beta 3

All Sky TOA LW Flux(W/m^2), Day & Night

TOA CERES/SARB Calculations Matched from CAVE Surface

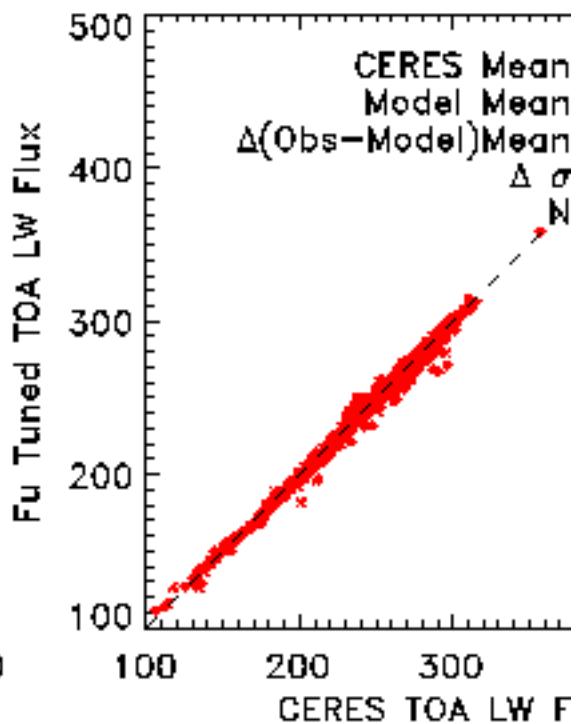
Apr 1998

TOA UnTuned LW Flux Up



Apr 1998

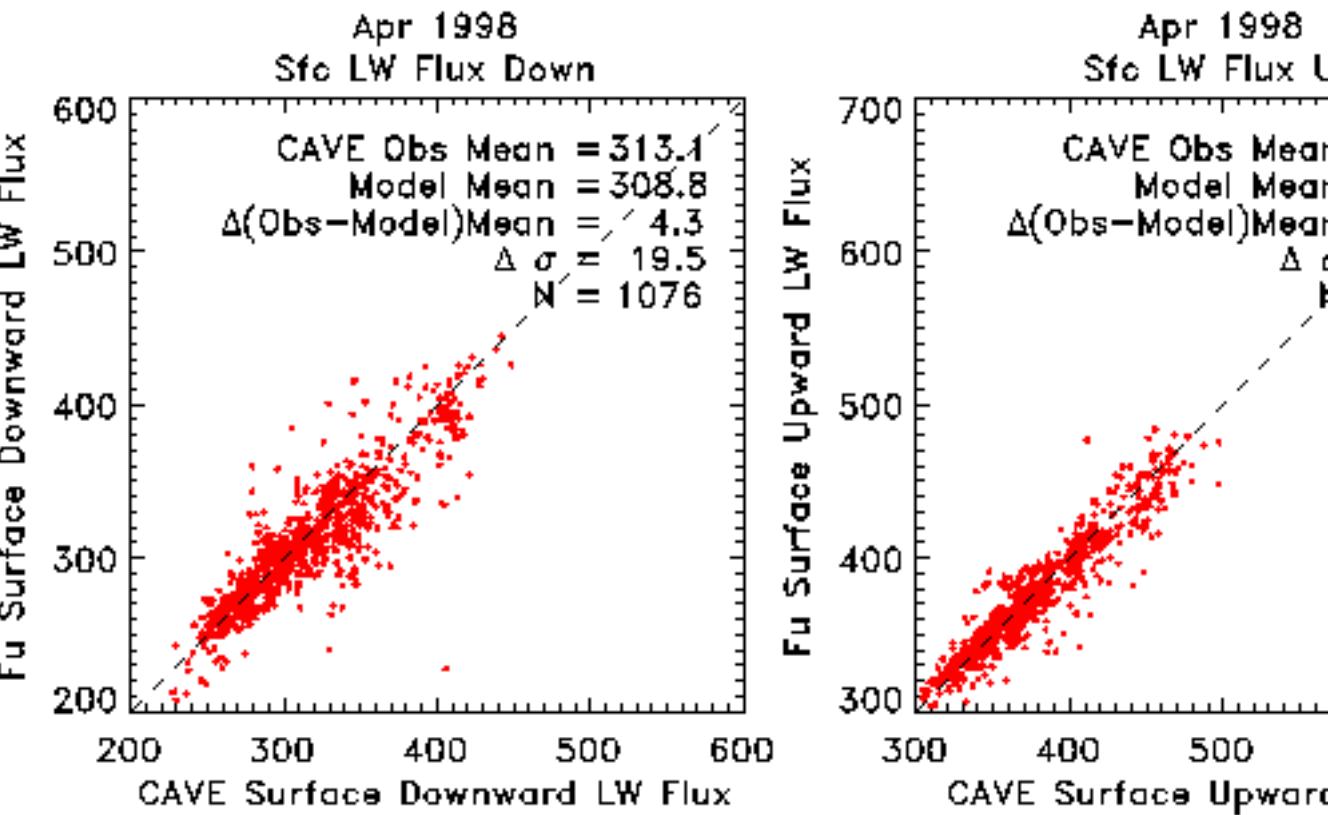
TOA Tuned LW Flu



Beta 3

All Sky Surface LW Flux (Day & Night)

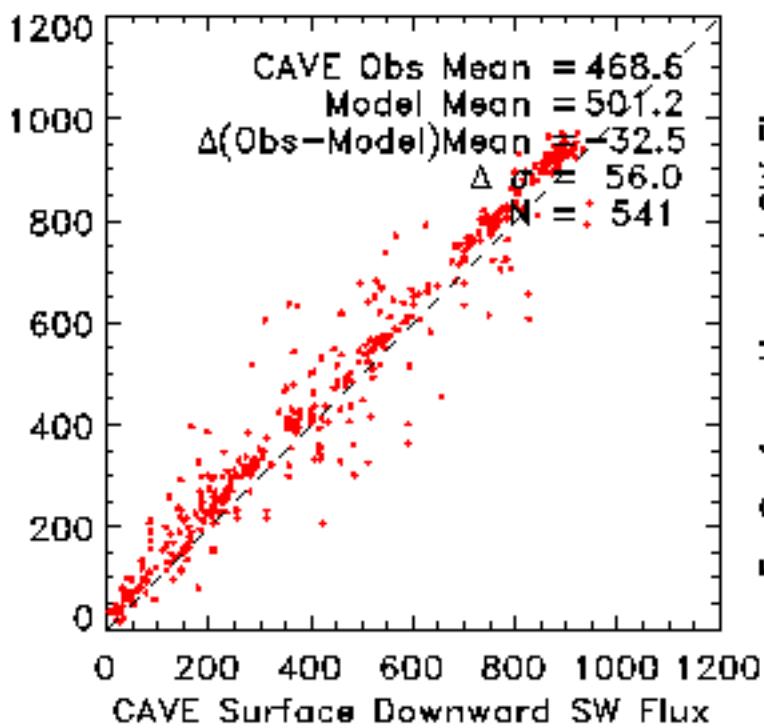
CERES/SARB Tuned Calculations Matched to CAVE Surface



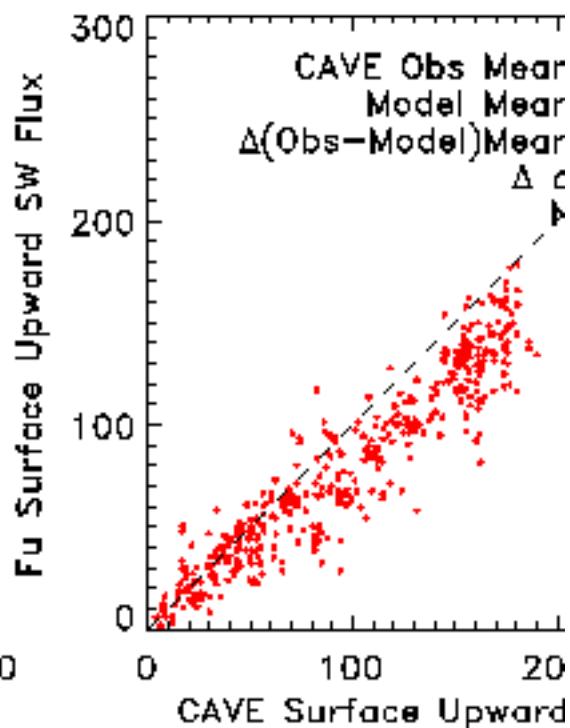
Beta 3
All Sky Surface SW Flux

CERES/SARB Tuned Calculations Matched to CAVE Surface

Apr 1998
Sfc SW Flux Down

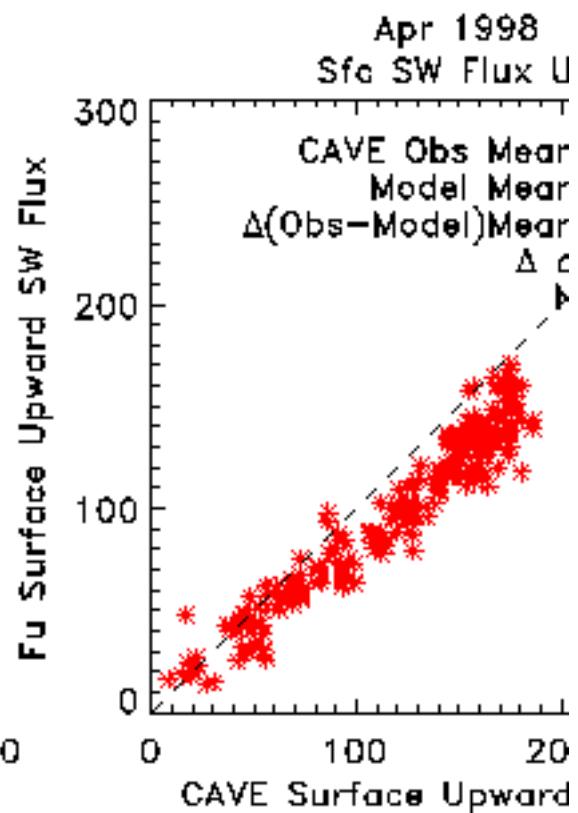
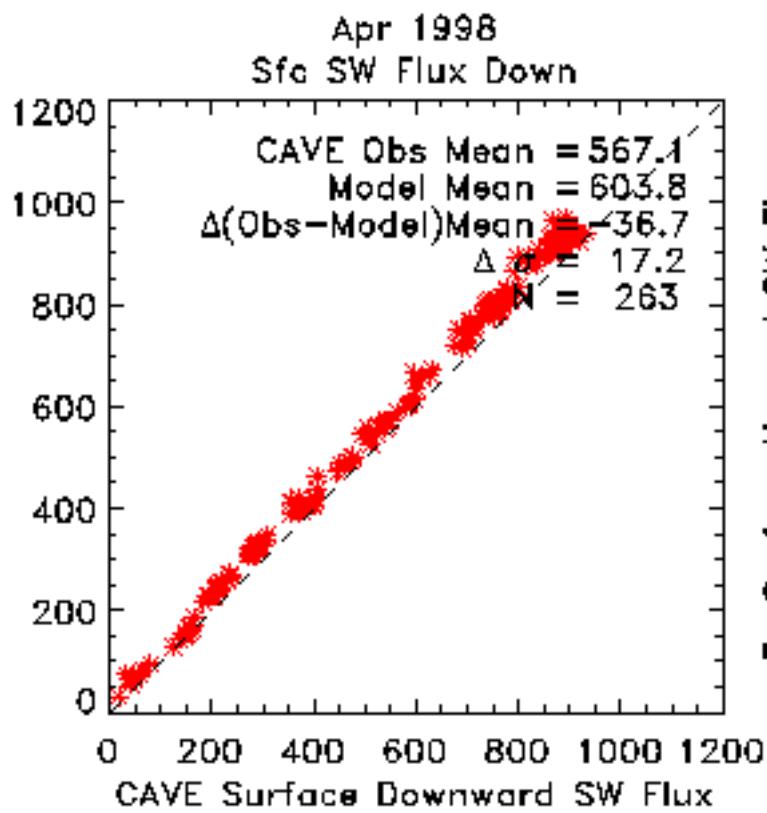


Apr 1998
Sfc SW Flux U



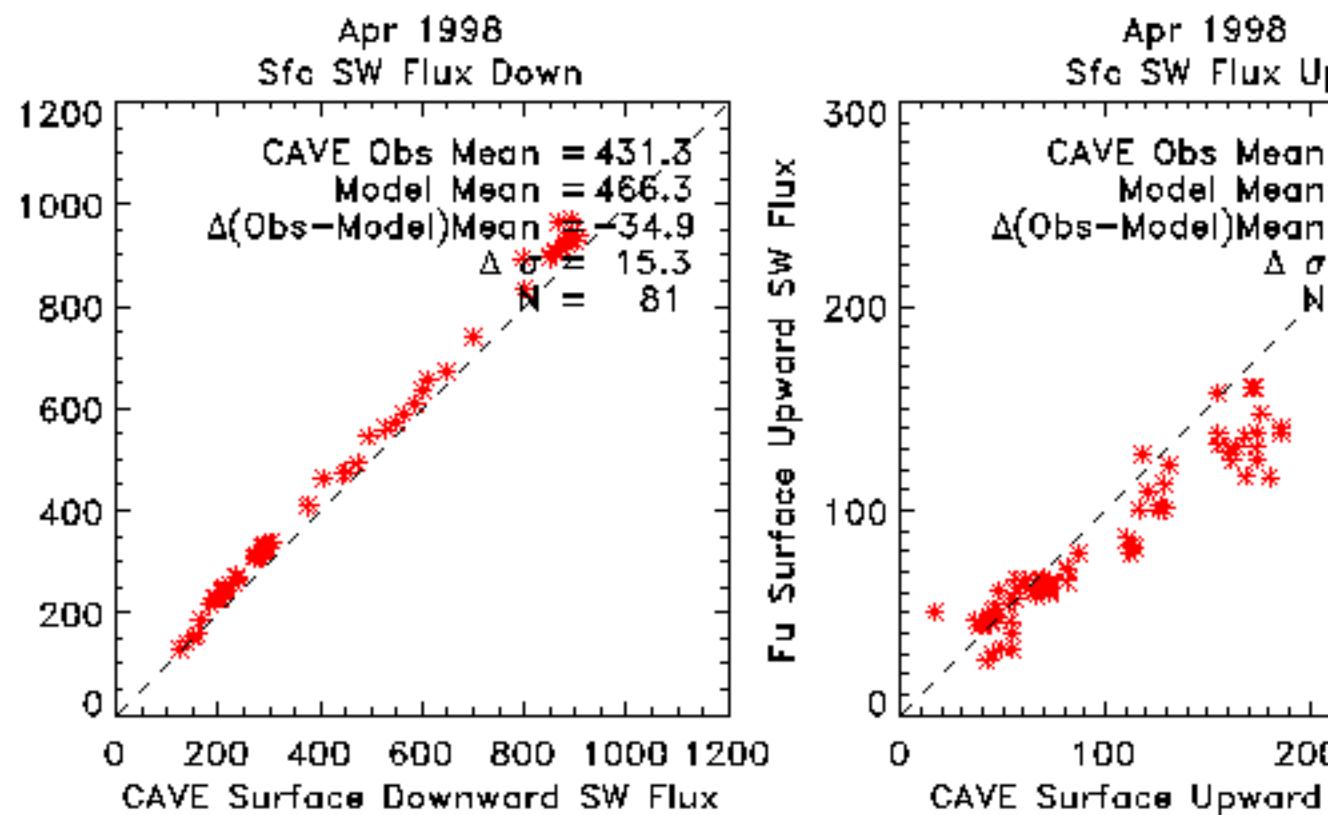
Beta 3

Surface SW Flux Clear Sky (VIRS CF = 0.00) Day
CERES/SARB UnTuned Calculations Matched to CAVE Surfac



Beta 3

Surface SW Flux Clear Sky (Long/Ack. CF = 0.00, VIRS +
CERES/SARB Tuned Calculations Matched to CAVE Surface

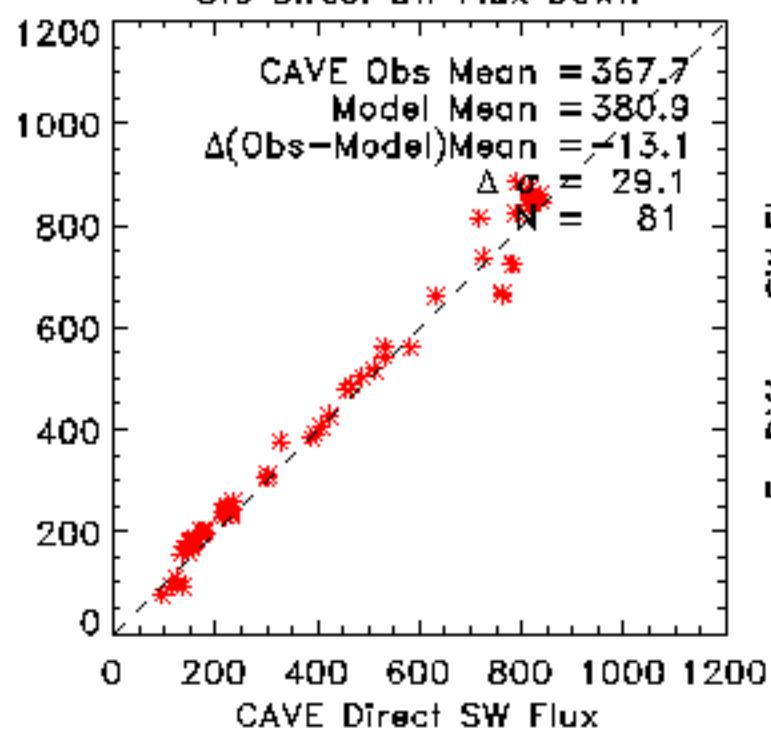


Surface SW Direct & Diffuse Flux (Beta 3)

CERES/SARB Tuned Calculations Matched to CAVE Surface
Clear Sky (Long/Ack. CF = 0.00, VIRS CF = 0.0

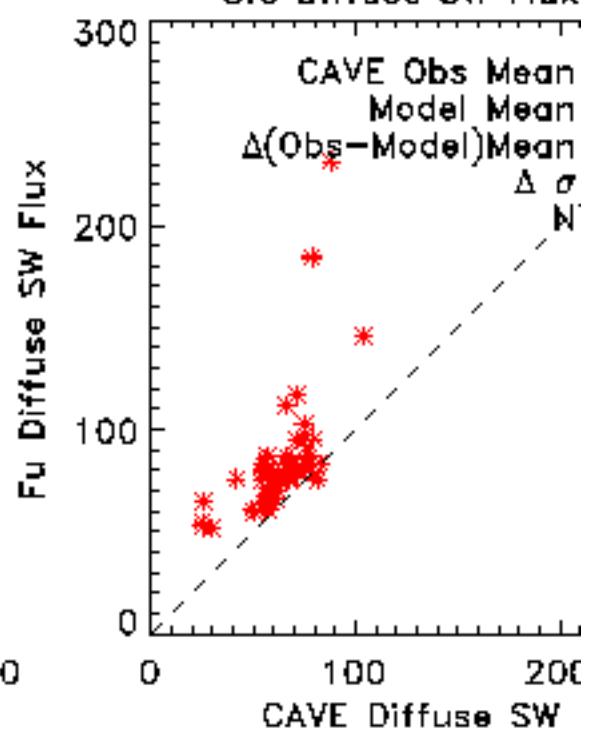
Apr 1998

Sfc Direct SW Flux Down



Apr 1998

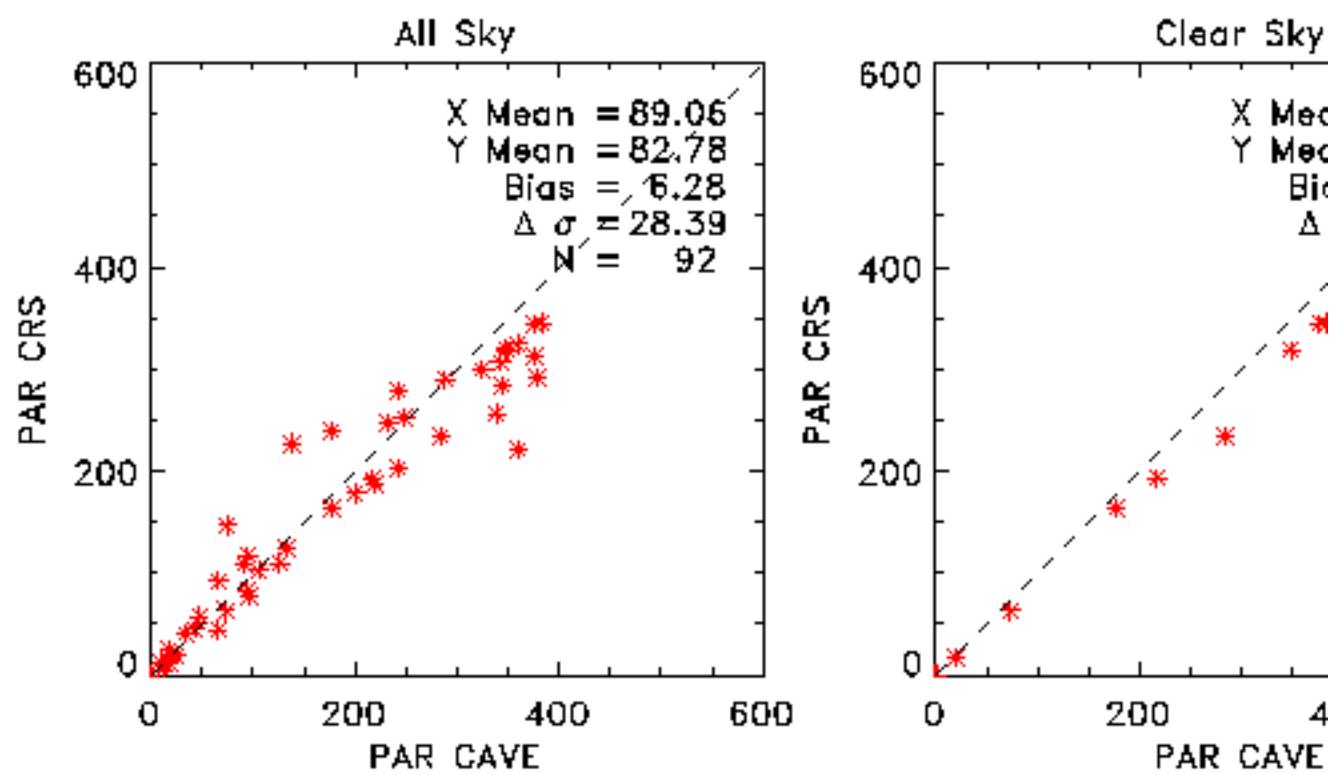
Sfc Diffuse SW Flux



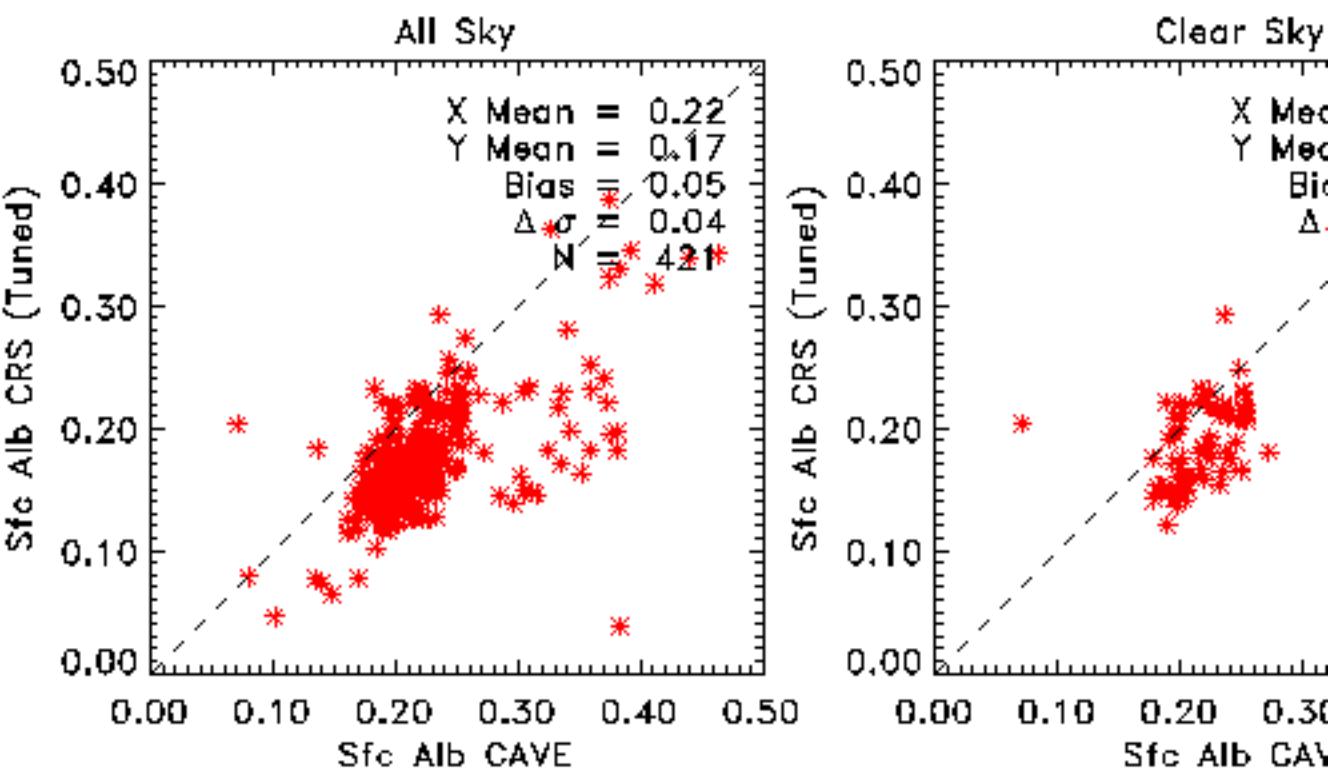
Offline (non-CRS) comparison of SW in clear skies.
 Model minus ARM SGP Central Facility (C01) during 2000.
 Wm-2.

	Model - Obs		Size N	Aerosol Forcing
	E13	C01		
Surface				
Direct normal	-4.1	-10.0	500	-131.3
Diffuse	6.7	5.2	500	58.6
Total	3.3	-2.1	500	-27.5
Direct horizontal =(dir norm)*cosSZA	-3.4	-7.3	500	-86.1
TOA reflected (Obs. here ES8, not SSF)	13.2	27.0	44	

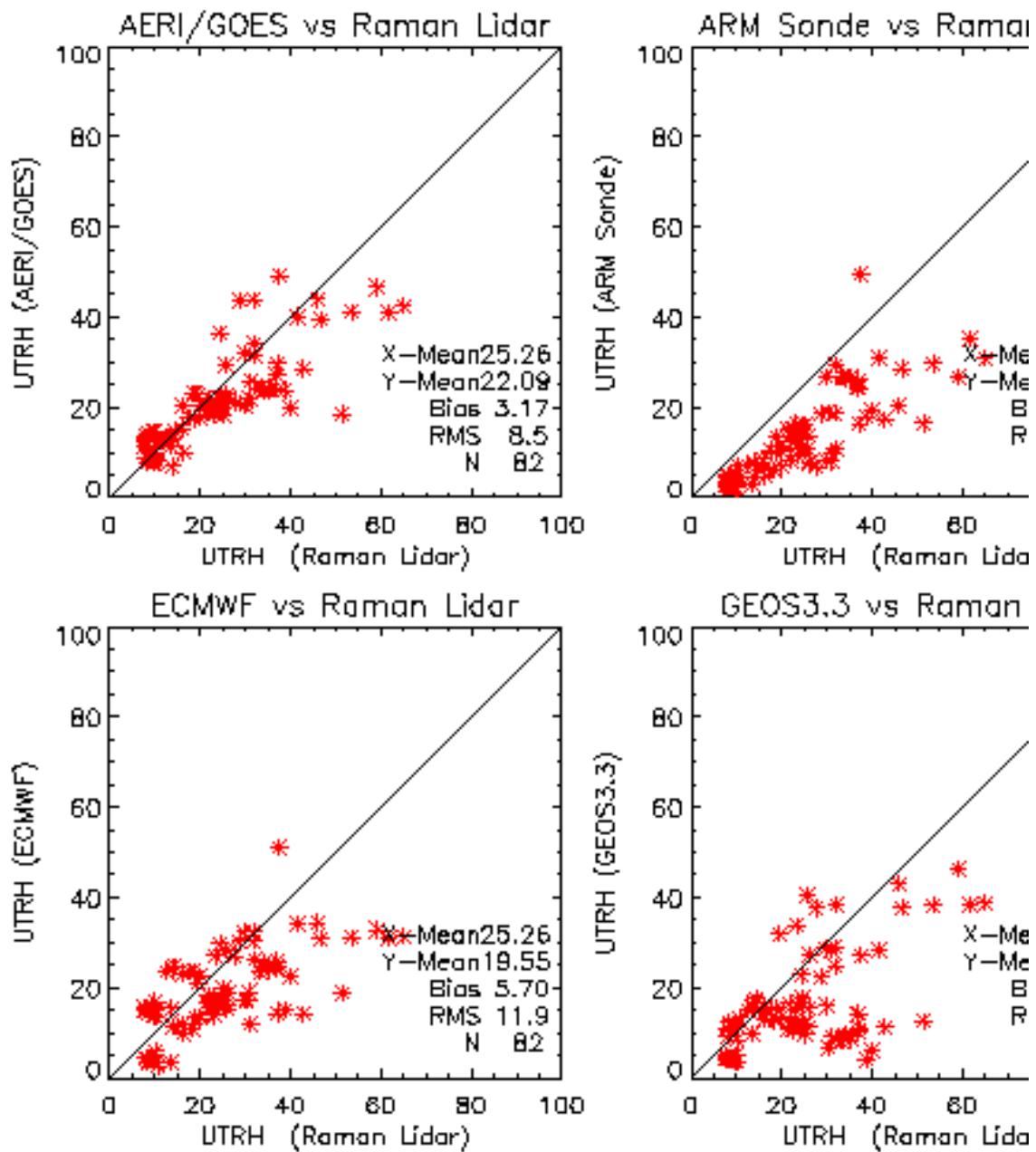
CRS Results, Beta 3, April 1998
Clear Sky (Long/Ack. CF = 0.00, VIRS CF = 0.



CRS Results, Beta 3, April 1998
Clear Sky (Long/Ack. CF = 0.00, VIRS CF = 0.

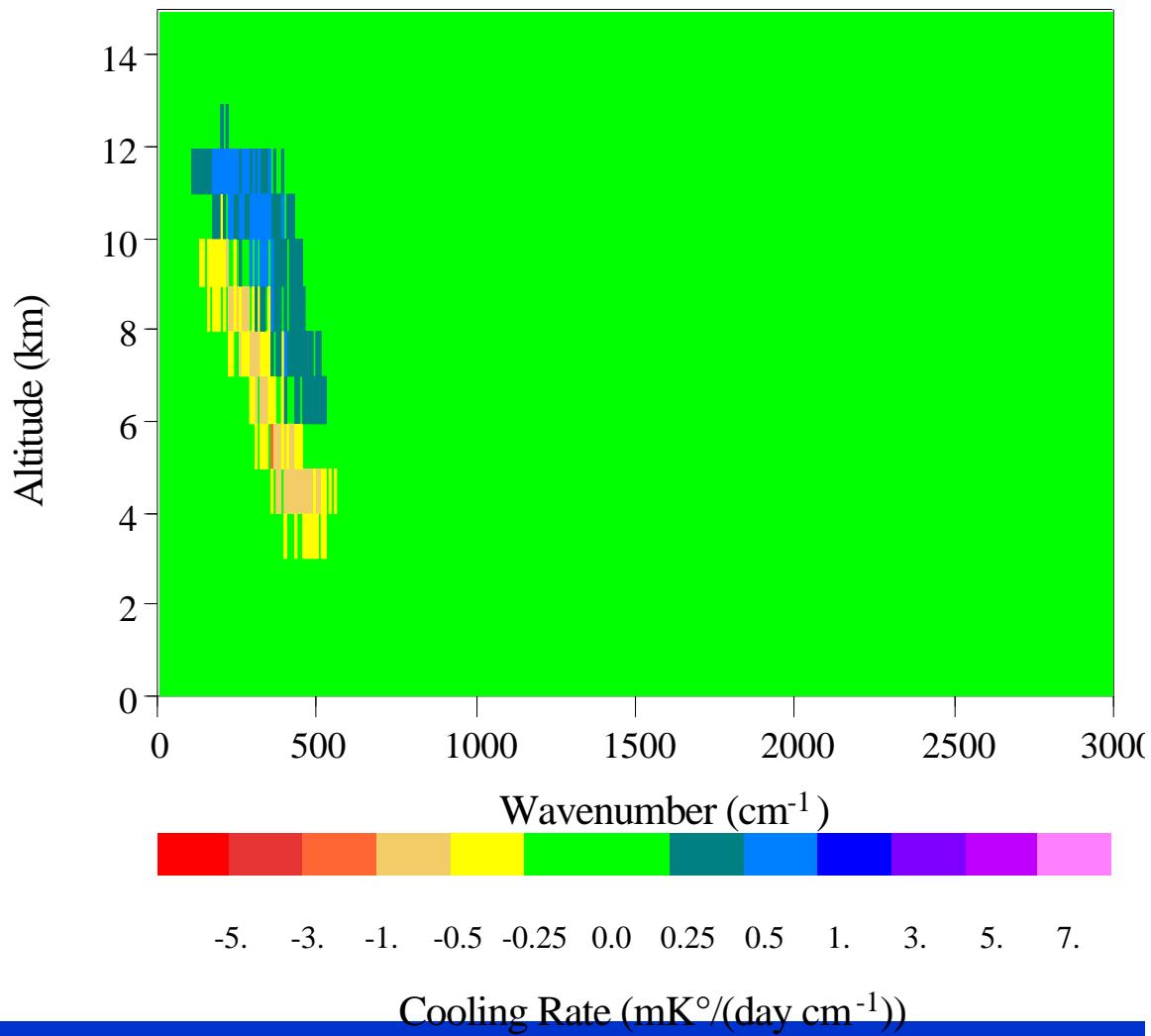


Upper Tropospheric Humidity Comparison, Nighttime,



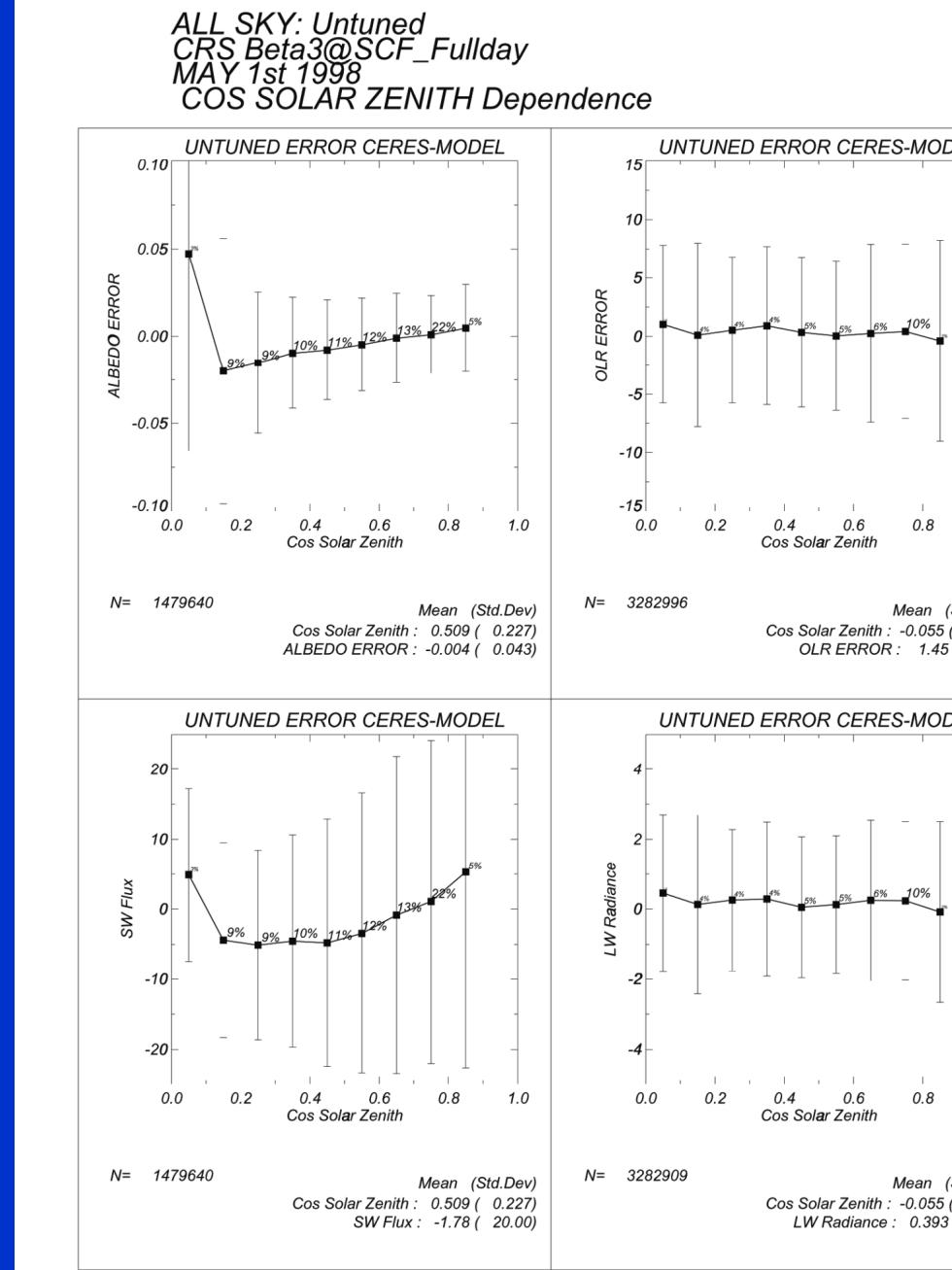


Case 1 - Case 2 Spectral Distribution of Clear-sky Cooling Rates



3 All sky Untuned

RES)-(Fu-Liou)
vs cos(SZA)



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